

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/002477

Box No. 1 Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material
☐ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material
☐ in written format
☐ in computer readable form
 - c. time of filing/furnishing
☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
	<ul style="list-style-type: none">- a substrate 1 with electrode 15 (figure 1; paragraphs 19, 25);- a DBR 2 (figure 1; paragraph 30);- an active pump layer 4 (figure 1; paragraph 29);- an AlGaAs current constriction layer 10 with an oxidized Al aperture 11 in the centre of the device (figure 1; paragraph 31);- a partly uncovered contact layer 13 with circular electrodes 14 (figure 1; paragraphs 25, 58);- a DBR 3 (figure 1; paragraph 30; a waveguide structure is formed between the DBRs 2 and 3);- a DBR 7 (figure 1; paragraph 35);- an active laser layer 6 of the VCSEL (figure 1; paragraph 33); and- a DBR 9, via which the laser radiation of the VCSEL is coupled out (figure 1; paragraphs 35, 66). <p>Therefore, the subject matter of claims 1-2, 8-13, 18 is not novel within the meaning of PCT Article 33(2).</p> <p>3. Dependent claims 3-7, 14-17, 19 do not appear to contain any additional features which, in combination with the features of any claim to which claims 3-7, 14-17, 19 refer back, meet the PCT requirements for inventive step. The reasons are as follows:</p> <p>3.1 Claims 3-7: a semiconductor laser device as defined in claims 1, 2 is known from D1 (see point 2 above). D1 discloses an uncovered portion in the form of a round pillar (figure 1; paragraph 58) and parallel trenches are a well-known alternative thereto and thus obvious, in the same way as further contacts or</p>

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a transparent etching stop layer (such a layer must also have been used in D1 even though this was not mentioned explicitly). The fact that the conductive intermediate layer must lie in the region of a node of the laser field in the case of an optically pumped VCSEL is known e.g. from D2 (figure 2b; claims 1, 2, 6, 7, 11, 16) and it is therefore obvious to take this into account in order to minimize losses.

- 3.2 Claims 14-17, 19: semiconductor laser device as defined in claim 1 is known from D1 (see point 2 above). Providing an external resonator mirror for the VCSEL is a method that is well known to a person skilled in the art e.g. for restricting the laser mode or stabilizing the laser frequency or performing frequency conversion and is thus obvious. D3 discloses e.g. an optically pumped VCSEL with an external mirror and frequency selection and conversion (figures 2, 6; paragraphs 48, 71). D1 discloses an active laser layer comprising quantum wells (paragraph 33) and quantum dots or wires are well-known alternatives, the use of which does not comprise an inventive step.

Therefore, the subject matter of claims 3-7, 14-17, 19 does not comprise an inventive step within the meaning of PCT Article 33(3).

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Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

The applicant is requested to file new figures 1-8 and 11, 12. The present figures are not suitable for reproduction and many structures which should be identified by reference signs are either indiscernible or the assignment is not clear since the LD depicted essentially appear as a uniformly black area with interrupted and unclear white line.

Different regions in the figure should be identified by hatching (PCT Rule 11.13).

Moreover, the reference sign "14" at the top of figure 1 should be changed to "4" in order to establish consistency with the description.

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box VI

The document cited above might be relevant to the novelty of claims 1, 8, 12-19 (figure 1; claims 1, 8-12, 21; page 8, line 14 - page 9, line 18; it is clear from figure 1 that at least part of the active layer 5 is arranged vertically downstream of the pump layer).